

More Immiscible Silicate Melt Partitioning: Light Lithophile and Platinum Group Elements

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Li, Be, B and Pd and Au partitioning between immiscible silicate melts were investigated as part of continuing studies of trace element partitioning between silicate melts, sulfide melts and fluids. The immiscible system used was the leucite-fayalite-silica+P₂O₅ system first investigated by Watson (76) and Ryerson and Hess (78). Immiscible melts within this system span the range of natural polymerized to de-polymerized melt structures and provide constraints on the compositional control of partitioning by the silicate melt.

Li, Be, and B were added as nitrate solutions to the K₂O-FeO-Al₂O₃-SiO₂-P₂O₅ base mixture and dried. Pd and Au were added as metal powders along with extra Fe to which formed a separate alloy phase. The mixture was contained within graphite-lined Pt capsules as part of a standard 3/4" piston-cylinder assembly. Runs homogenized at 1500°C and 10 kbar for 36 hours before reducing to the 1150-1250°C and 0.8 GPa run conditions, which were held for 4-5 days. This was sufficient time for the melts to cleanly separate into 0.1 to 0.5 mm pockets. Runs below 1200°C also contained a stable silica phase. Polished sections were analyzed using the electron microprobe and S.I.M.S. Platinum-group elements will be analyzed with negative secondaries using standards characterized by neutron activation.

Li and Be both partitioned preferentially into the iron-rich melt, with partition coefficients of 1.2 to 1.5; with larger Ds at lower temperatures as the immiscibility gap increases. Boron showed no significant preference for either melt. This similar lack of strong preference is despite large differences in ionic field strength between the three ions.

Work performed under the auspices of the U.S. Dept. of Energy at LLNL under contract no. W-7405-Eng-48.